

REMARKS

The Office Action of May 10, 2011, was received and carefully reviewed. Claims 87, 88, 90, 123, 124 and 126 were pending in this application prior to the instant amendment. By this amendment, claims 88 and 124 are canceled. Thus, claims 87, 90, 123 and 126 are currently pending for consideration.

Claim Rejections Under 35 U.S.C. § 112

Claims 88 and 124 stand rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Specifically, the Examiner asserts that it is not clear in claims 88 and 124 whether Applicants claim that “each of said crystalline semiconductor islands of said first and second thin film transistors” further “comprises a material selected from the group consisting of Fe, Co, Ni, Ru, Rh, Pd, Os, Ir, Pt, Cu, Ag, Au”, in addition to “nickel” recited in claims 87 and 123. *See, page 2 of the Office Action.* Without conceding in detail the merits of this rejection, Applicants herein cancel claims 88 and 124. Thus, Applicants respectfully request withdrawal of the rejection of claims 88 and 124 under 35 U.S.C. § 112, which is hereby rendered moot.

Claim Rejections Under 35 U.S.C. § 103

Claims 87, 88, 90, 123, 124 and 126 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,275,851 to Fonash et al. (“Fonash”), in view of U.S. Patent No. 5,650,664 to Sakamoto (“Sakamoto”). This rejection is traversed for at least the reasons advanced in detail below.

In the Office Action, the Examiner asserts that Fonash discloses a semiconductor device substantially as recited in independent claims 87 and 123. The Examiner concedes that Fonash fails to disclose a number of features of these claims, however, and instead cites Sakamoto as allegedly disclosing a semiconductor device comprising a thin film transistor provided in a matrix pixel circuit over a substrate, and a second thin film transistor provided in a peripheral driving circuit over the substrate. *See, page 4 of the Office Action.*

The Examiner further concedes that Fonash in view of Sakamoto differ from claims 87 and 123 because they fail to show that at least one of hydrogen and halogen element is contained at a concentration not higher than $1 \times 10^{20} \text{ cm}^{-3}$ in the monodomain regions of the first and second thin film transistors; the crystalline semiconductor island of said second thin film transistor includes nickel at a concentration of $1 \times 10^{17} \text{ cm}^{-3}$ to $5 \times 10^{17} \text{ cm}^{-3}$; and the

crystalline semiconductor island of said first thin film transistor includes nickel at a concentration of $1 \times 10^{16} \text{ cm}^{-3}$ or less. *See, pages 4-5 of the Office Action.* The Examiner argues, however, that “[i]t would have been obvious, if not inherent” that hydrogen is contained not higher than the recited concentration in the monodomain regions of the first and second thin film transistors, because hydrogen is a common contaminant that can diffuse through insulating or metal layers, and that its concentration should be controlled to achieve a desired mobility for the thin film transistors. *See, page 5 of the Office Action.* The Examiner further argues that it would have been obvious that the crystalline semiconductor islands of the first and second thin film transistors may include nickel at the claimed concentrations, because a concentration of nickel can be controlled. *Id.*

Applicants respectfully disagree with the Examiner, and submit that the Examiner has failed to establish a *prima facie* case of obviousness with respect to independent claims 87 and 123. On page 3 of the Office Action, the Examiner argues that Fonash discloses the claim limitation, “wherein the crystalline semiconductor island of the thin film transistor is formed in a monodomain region which contains no grain boundary”, because “the nickel layer 12 is formed at a bottom surface of an amorphous silicon layer to crystallize the amorphous silicon layer and can be patterned as isolated islands and thus would not have grain boundaries”. *See, page 3 of the Office Action.* In other words, the Examiner believes that Fonash inherently discloses a crystalline semiconductor island formed in a monodomain region which contains no grain boundary.

However, the Examiner has failed to meet the burden of proof required to both establish inherency and to shift the burden to Applicants to show an unobvious difference. According to *Ex parte Levy*, “[i]n relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art.” 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (*emphasis in original*). Further, the evidence must make clear not only “that the missing descriptive matter is necessarily present in the thing described in the reference”, but also “that it would be so recognized by persons of ordinary skill.” *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999). The Examiner has failed to establish that a monodomain region containing no grain boundary necessarily results from the teachings of Fonash.

Fonash is directed to a method for forming large grain polycrystalline silicon films and for achieving selective crystallization of such films. *See, for example, col. 1, lines 8-11*

of Fonash. The large grain polycrystalline silicon films are formed in one embodiment of Fonash by depositing a palladium layer 12 beneath amorphous silicon layer 14 prior to crystallization, thereby accelerating the crystallization. *See, for example, col. 2, lines 59-66 of Fonash.* In another embodiment, the palladium layers 12 “are not continuous films but are composed of isolated palladium islands”, upon which the amorphous silicon layer 14 selectively crystallizes at an accelerated rate. *See, for example, col. 2, lines 1-3 and 24-27 of Fonash.*

Based on these and other disclosures of Fonash, it is clear that the Examiner did not provide “cogent technical reasoning to support the conclusion of inherency”, because one of ordinary skill in the art would understand that a semiconductor layer obtained by patterning a polycrystalline semiconductor would or could naturally include grain boundaries. *See, Ex parte Levy*, 17 USPQ2d at 2462. Applicants note that the term “polycrystalline” in itself even implies the existence of grain boundaries. Thus, the allegedly inherent characteristic of a layer having no grain boundaries would not necessarily flow from the teachings of Fonash. Assuming *arguendo* that it were even possible that polycrystalline silicon layer 14 could contain no grain boundaries, which Applicants do not necessarily concede, “[i]nherency [...] may not be established by probabilities or possibilities. Sakamoto, cited by the Examiner as allegedly disclosing a first thin film transistor provided in a matrix pixel circuit and a second thin film transistor provided in a peripheral driving circuit, fails to overcome these deficiencies of Fonash.

Because the Examiner has failed to meet the initial burden of proof to establish inherency, the Examiner has also failed to establish a case of *prima facie* obviousness of independent claims 87 and 123. Thus, Applicants respectfully requested withdrawal of the rejection of independent claims 87 and 123. The rejection of claims 90 and 126 is improper at least by virtue of their dependence on claims 87 and 123, respectively. The rejection of claims 88 and 124 is rendered moot by virtue of their cancellation herein.

Double Patenting

Claims 87, 88, 90, 123, 124 and 126 stand rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-4, 6, 8, 9 and 11 of U.S. Patent No. 5,614,733 to Zhang et al. (“Zhang”), in view of U.S. Patent No. 4,766,477 to Nakagawa et al. In making this rejection, the Examiner substantially ignores the limitation of independent claims 87 and 123 relating to a monodomain region which contains no grain

boundary, because “the limitations ‘monodomain region’ and ‘grain boundary’ are not defined and thus can be broadly interpreted to refer to active regions [...] claimed in Zhang et al.” *See, page 11 of the Office Action.*

Applicants respectfully disagree with this assertion. Although the claims must be given their broadest reasonable interpretation, such an interpretation must also be consistent with the interpretation that one skilled in the art would reach. *See, In re Cortright*, 165 F.3d 1353, 1359, 49 USPQ2d 1464, 1468 (Fed. Cir. 1999). Applicants submit, however, that one skilled in the art would clearly understand the meaning of “monodomain region” and “grain boundary”, particularly in light of the specification. Thus, Applicants respectfully request that the Examiner explain (1) why such terms “can be broadly interpreted to refer to active regions”, and (2) why such a limitation would have been obvious over the “active region” of Zhang, in order to provide proper support this rejection.

Conclusion

In view of the foregoing, Applicants respectfully request allowance of the instant application. If a conference would be helpful in expediting prosecution of the instant application, the Examiner is invited to telephone the undersigned to arrange such a conference.

Respectfully submitted,

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